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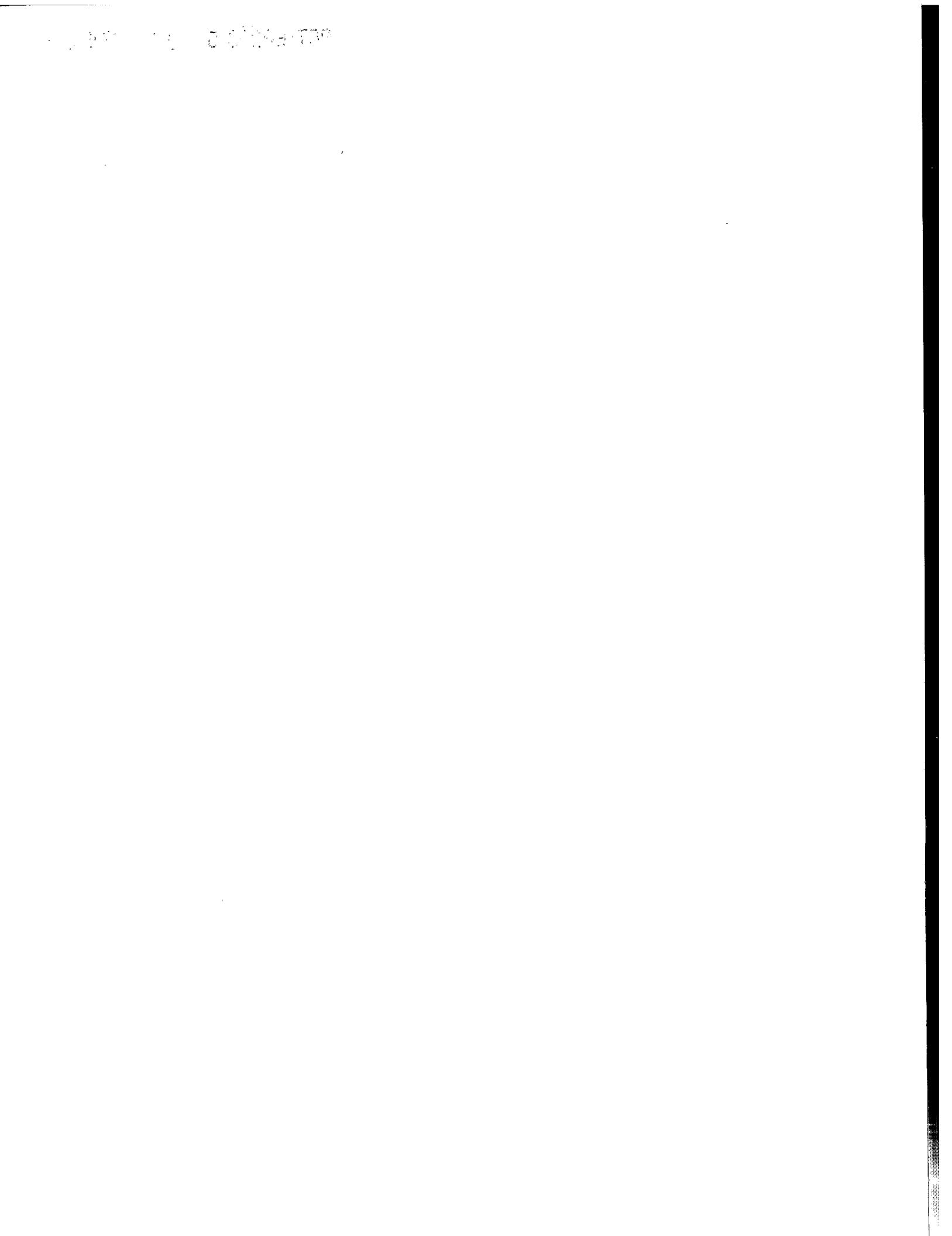
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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

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(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Method and device for generating a menu

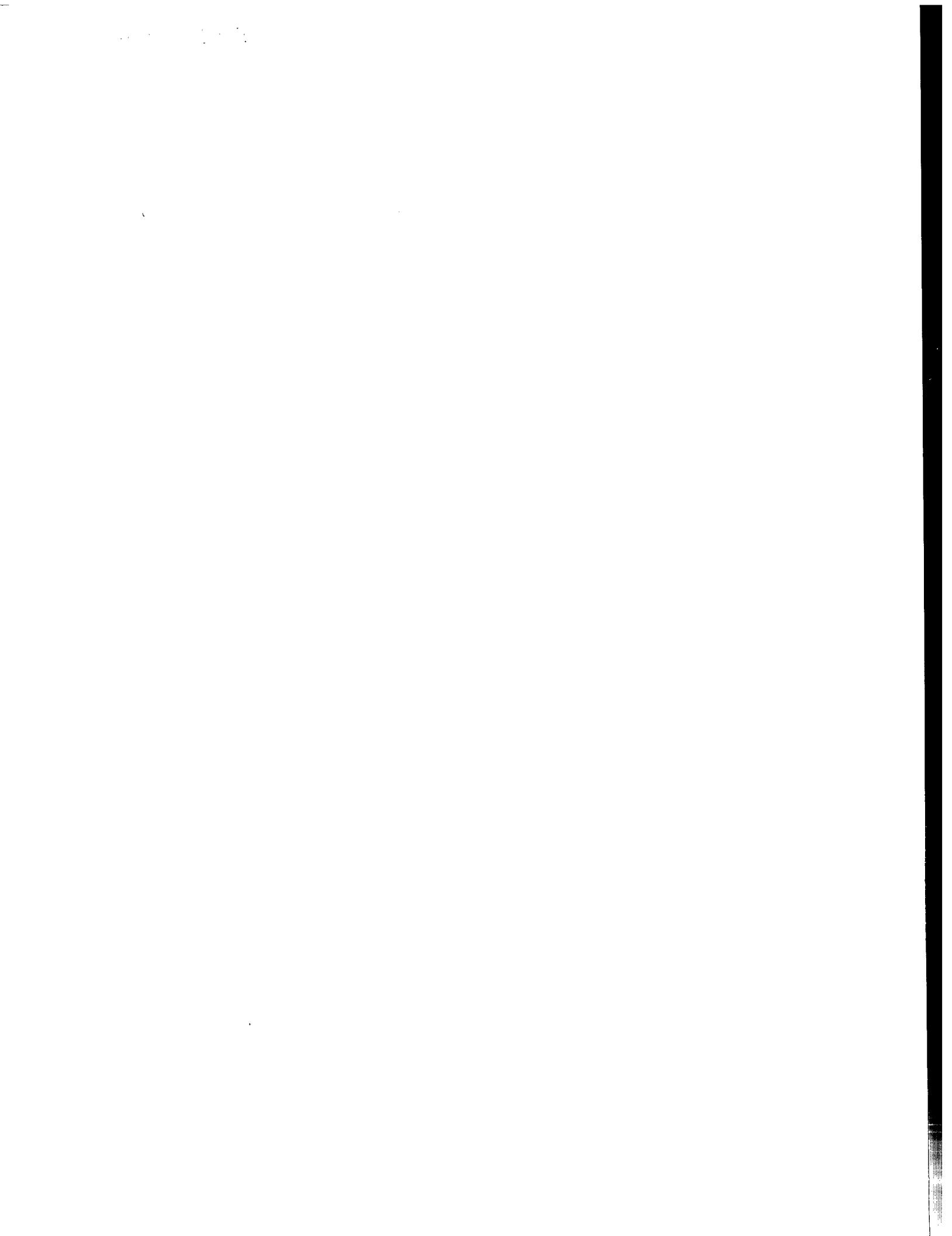
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Method and device for generating a menu

The invention refers to a method and a device for generating a menu for a video recording medium, wherein the menu is coded according to an MPEG like standard. Such MPEG like standard is for example known as MPEG 1, MPEG 2 but also similar encoding methods exist that use base pictures and predicted pictures based on these base pictures.

It is an object of the invention to propose a method and a device for generating such menu.

A method according to the invention starts with a predefined intra-coded picture that consists of blocks and generates an inter-coded picture, whereby the inter-coded picture contains no change information for predefined blocks while it contains change information for selected blocks. The selected blocks contain picture information that is representative for a recording on the recording medium. Both, the intra-coded picture and the inter-coded picture are taken as menu information and stored accordingly on the recording medium. Intra-coded pictures are often referred to as I-pictures while inter-coded pictures are usually referred to as P-pictures. An inter-coded picture is based on a preceding intra-coded picture and contains just the change information between these two pictures. An advantage of the inventive method is that no time is needed for encoding the predefined picture. The predefined picture is preferably the background of the menu as for example a company logo, a user defined picture or the like. The only time to be spent is for encoding a small number of selected blocks that contain the representative information of a recording on the recording medium. This allows to quickly finish the menu and thus to

use a comparatively slow or low performance encoder without negative effect to the user.

Preferably, the picture information representative for more than one recording is used for generating the inter-coded picture. If a menu contains several recordings, smaller block areas for each recording are used. This has the advantage that a menu for several recordings is generated in about the same time as for one or a very small number of recordings.

According to the invention a menu is updated with information related to another recording on the recording medium by generating an inter-coded picture having changes only for selected blocks containing picture information representative for the respective other recording. Selected blocks are for example selected for recording 1, recording 2 and so on, which are displayed on the same menu page. Changes may be adding or removing a recording from the recording medium or replacing the representative picture information for one recording by another representative picture information for example a one selected by the user.

Advantageously, an inter-coded picture is added to the previous inter-coded picture. It may either replace the previous inter-coded picture with the new one or combine the previous inter-coded picture with the new one or add the new one as a further picture.

A device for generating a menu for a video recording medium comprises a predefined intra-coded picture memory, a representative picture memory, and an encoder for generating an inter-coded picture using an output of the intra-coded picture memory as basis and an output of the representative picture memory as change information to be encoded. This has

the advantage of time saving as the predefined basis picture is already encoded and only differences need to be encoded. For this not much encoding capacity is needed.

Preferably, the device according to the invention is provided with a fast encoder and a slow encoder wherein the slow encoder is used for menu generation and the fast encoder is used for encoding a moving video sequence. The slow encoder preferably is represented by software while the fast encoder preferably is represented as hardware. One advantage is that the fast encoder is enabled to work uninterrupted by the menu generation, e.g. for providing a display device with moving image information or for providing a recording device with encoded moving image information while, at the same time but independently, the slow encoder performs the menu generation. Thanks to the time saving of the invention even the menu generation by the slow encoder does not give the user the feeling of low speed performance.

A recording medium according to the invention has recorded on it one or several recordings like videos, still pictures, audio sequences etc., and a menu recording for information about at least one recording. The menu recording comprises a predefined intra-coded picture, which is the same for every recording medium generated by the same recording device, and at least one inter-coded picture having difference information only for selected areas, wherein the difference information is related to picture information representative of a recording. That means the inter-coded picture contains change information only for certain areas, for example a certain range of blocks, and only there exist differences. The differences refer to one or several picture information representative of a recording on the recording medium.

More details and advantages of the invention will become apparent from the following description.

Figs. 1 to 3 show examples of pictures used for menu generation,

Fig. 4 shows a device according to the invention, and

Fig. 5 shows a recording medium according to the invention.

Fig. 1 shows an example for a predefined intra-coded picture I1 being indicated as "background".

Fig. 2 shows an inter-coded picture P1 containing change information only in the areas of selected blocks REC1 and REC2. It indicates further possible areas of selected blocks REC3, REC4. Selected block areas REC1 and REC2 contain picture information that is representative for two recordings on the recording medium. The areas indicated by REC3, REC4 refer to selected blocks that shall contain further representative picture information for future recordings on the recording medium.

Fig. 3 shows the menu as displayed based on a combination of intra-coded picture I1 and inter-coded picture P1.

Fig. 4 schematically shows important elements of a device according to the invention. A memory M1 is provided for storing one or several intra-coded pictures I1 while memory M2 is provided for storing picture information being representative for one or several recordings on the recording medium. An encoder E1 uses the intra-coded picture of memory M1 and the representative picture information for memory M2 to calculate the inter-coded picture P1. For this, calculation is to be done only for the areas indicated by

REC1 and REC2 in Fig. 2 in case of two recordings to be entered to the menu. The calculated inter-coded picture P1 is transmitted via line P to a recorder R1 that also receives the intra-coded picture I1 via line I for recording both as menu information on a recording medium.

The encoder E1 is a slow encoder, for example a software encoder, while another encoder E2 is a fast encoder preferably a dedicated encoder IC that receives moving video input MVin to be encoded and outputs encoded moving video information MVout. As can be seen, both encoders E1, E2 work in parallel and independently of each other.

Fig. 5 shows diagrammatically a recording medium as optical disk D1 having a track 2 containing recordings as indicated in the zoomed area Z1 showing a recorded menu M, a first recording R1 and a second recording R2. Possible future recordings R3, R4, are indicated by dashed lines. In a second zoom area Z2 it is shown that the menu is provided with an intra-coded picture I1 and an inter-coded picture P1. It is to be understood, that this schematic picture only shows a very small number of details that are relevant to the invention.

Definition of the technical problem which is to be solved by the invention

If the disc menu is encoded by the hardware encoder, during the generation of disc menu, the user can't see the LIVE picture because there is only one encoder available in the recorder.

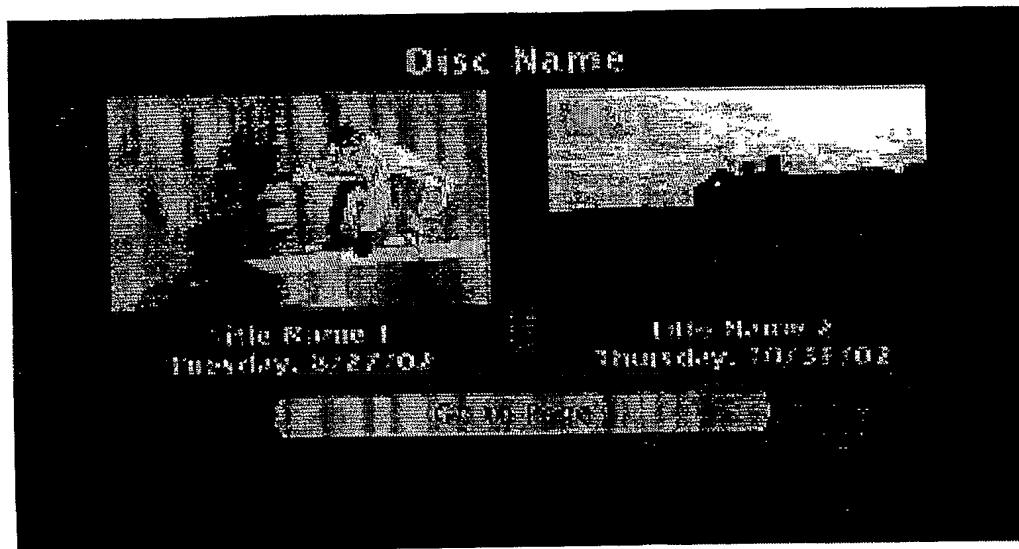
If the disc menu is encoded as one I-frame by software encoder, the LIVE picture can be watched during the menu generation, but it takes at least 30secs to encode the disc menu that includes a logo and thumbnail(s) on the disc menu page, the user can't access the disc or the tray by then.

Brief summary of the main elements of the invention:

One menu page has been divided into two frames: I-frame (background picture) and P-frame(s) (only thumbnails).

Detailed description of at least one embodiment of the invention accompanied by appropriate drawings:

The disc menu format created in the recorder according to the invention is shown below. Each menu page consists of video packs and sub-picture packs.



Before this invention, the MPEG encoder is used to encode the disc menu page --- Single I-frame shown below that includes the background picture and thumbnails of recordings (this method is called a hardware encoding method because it is done using the MPEG encoder chip)



(I-frame)

Steps of hardware encoding:

Stop encoding the LIVE picture

Use MPEG encoder to encode one frame of the still picture

After the still picture is successfully encoded, the MPEG encoder carry on to encode the LIVE picture

Disadvantages of using hardware encoding:

When the MPEG encoder is stopped, the LIVE picture will be frozen, the user can't view the LIVE video

Sometimes the encoder couldn't be stopped properly, the still picture couldn't be encoded, the user can see the title in the title list menu, but the user can't see this certain recording in disc menu

Even if the still picture is successfully encoded, the user has lost a few seconds of viewing LIVE picture (The user will feel pain if the end of story is shown during these few seconds)

Before this invention, the software encoding is used to encode the menu page ---- single I-frame shown below that includes the background picture and thumbnails of recordings



Steps of single I-frame software encoding:

Apply DCT to all of video blocks when the new recording is done

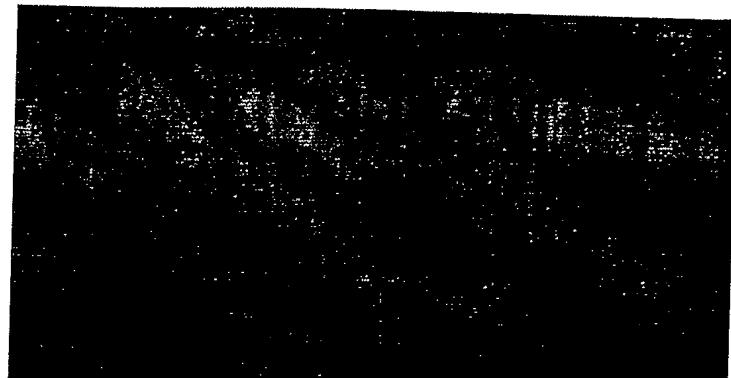
Apply quantization to all of video blocks after DCT

Disadvantages of single I-frame software encoding:

Because of a lot of calculations in the software encoding, and normally the host CPU of the DVD recorder is not so fast, the speed of encoding menu page is obviously slow down compare to hardware encoding

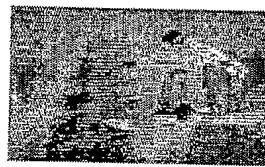
With this invention, the software encoding is used to encode the disc menu page, though the disc menu page includes background picture and thumbnail of recordings, only thumbnails of recordings are encoded when the new recording is done.

The structure of video packs in the menu page is shown below that includes I-frame and P-frame(s)



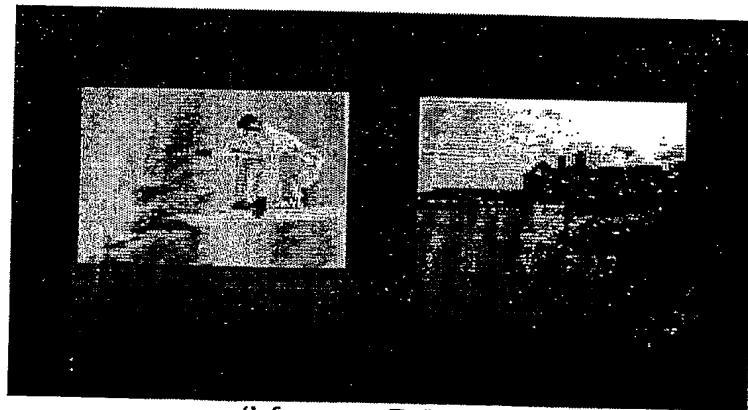
(I-frame)

+



(P-frame)

=



(I-frame + P-frame)

Steps of P-frame(s) software encoding:

The background picture is considered as I-frame in the menu page, so it takes no time to encode it. Because the background picture is a still picture in MPEG format, it is usually stored in static memory.

The thumbnail of new recording is considered as P-frame, in this method, it only takes time to encode the difference between the background and the menu page. This difference is thumbnail(s).

Only apply DCT to video blocks of thumbnail(s) when the new recording is done

Only apply quantization to video blocks after DCT

Advantages:

The LIVE picture is still there after the new recording is done because we don't

need stop the mpeg encoder to encode the still picture.

This method is more faster than the normal software encoding

Indication of the advantages of the invention

Users can see the LIVE picture during the disc menu generation if the recorder is in LIVE mode because software encoding is implemented on our recorder. (So far known recorders do not show LIVE picture during disc menu generation)

It takes a shorter time to software encode the disc menu page because I-frame (background) is always same in every menu page and only P-frame is software encode when the new recording is done

Patent claims

1. Method for generating a menu (M) for a video recording medium (D1), the menu (M) being coded according an MPEG like standard, having the steps of
 - starting with a predefined intra-coded picture (I1) consisting of blocks,
 - generating an inter-coded picture (P1) having no change information for predefined blocks, and having change information for selected blocks (REC1, REC2) containing picture information representative for a recording (R1, R2) on the recording medium (D1), and
 - using both, the intra-coded picture (I1) and the inter-coded picture (P1) as menu information.
2. Method according to claim 1, wherein picture information representative for more than one recording (R1, R2) is used for generating the inter-coded picture (P1).
3. Method according to one of the preceding claims, wherein a menu (M) is updated with information related to another recording (R3, R4) on the recording medium (D1) by generating an inter-coded picture (P1) having changes only for selected blocks (REC3, REC4) containing picture information representative for the respective recording (R3, R4).
4. Method according to one of the preceding claims, wherein an inter-coded picture (P1') is added to the previous inter-coded picture (P1).
5. Device for generating a menu (M) for a video recording medium (D1), the menu (M) being coded according to an MPEG like standard, the device having a predefined intra-

coded picture memory (M1), a representative picture memory (M2), an encoder (E1) for generating an inter-coded picture (P1) using an output of the intra-coded picture memory (M1) as basis and an output of the representative picture memory (M2) as changes to be recorded, and a recording unit (R1).

6. Device according to claim 5, **characterized in that** it is provided with a fast encoder (E2) and a slow encoder (E1), the slow encoder (E1) being used for menu generation and the fast encoder (E2) being used for encoding a moving video sequence.
7. Recording medium D1 having recorded on it one or several recordings (R1, R2, R3, R4) and a menu recording (M) for information about at least one recording (R1, R2, ...), **characterized in that** the menu recording (M) comprises a predefined intra-coded picture (I1) and at least one inter-coded picture (P1) having difference information only for selected areas (REC1, REC2 ...), the difference information being related to picture information representative for a recording (R1, R2...).

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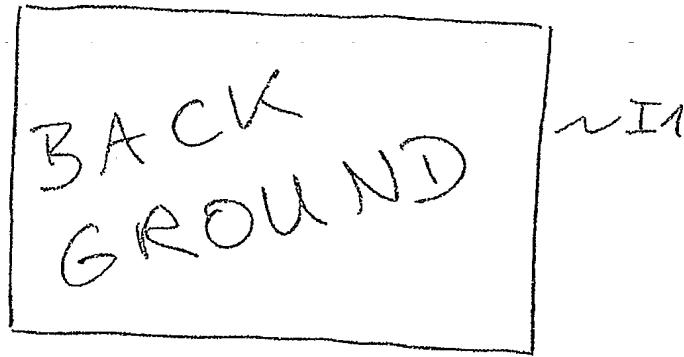


Fig 1

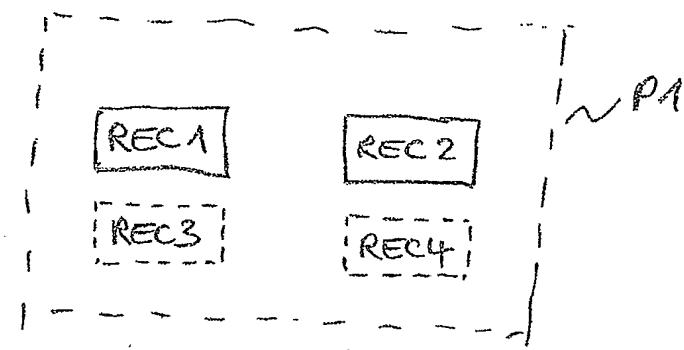


Fig 2

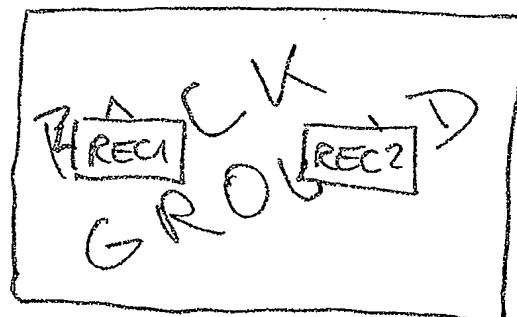


Fig 3

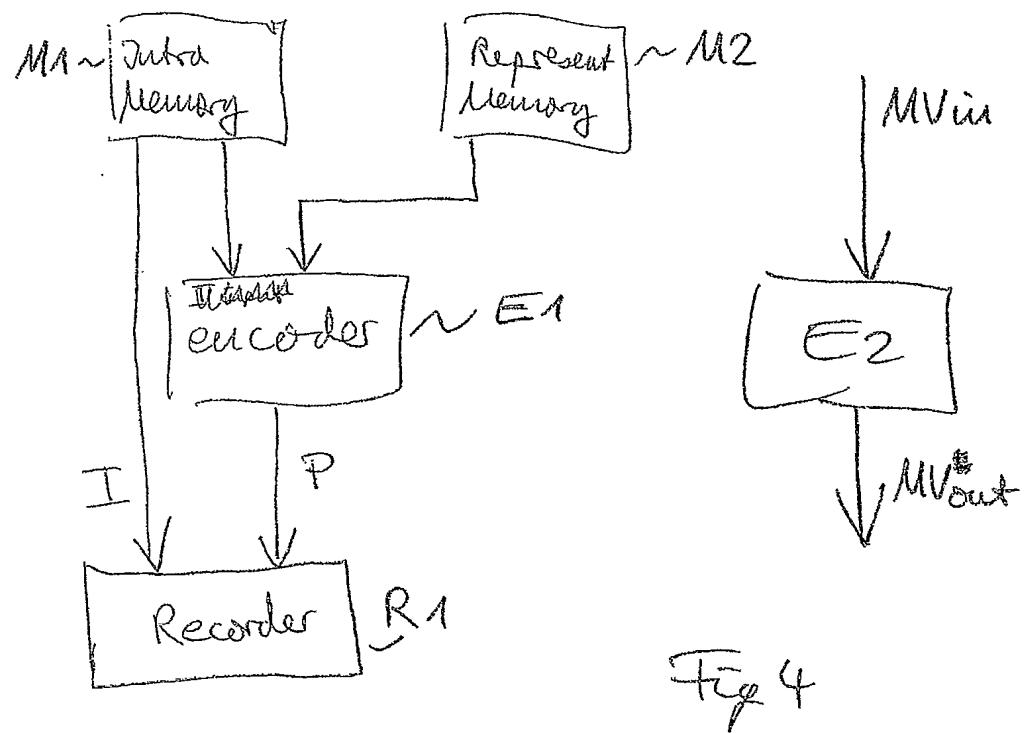


Fig 4

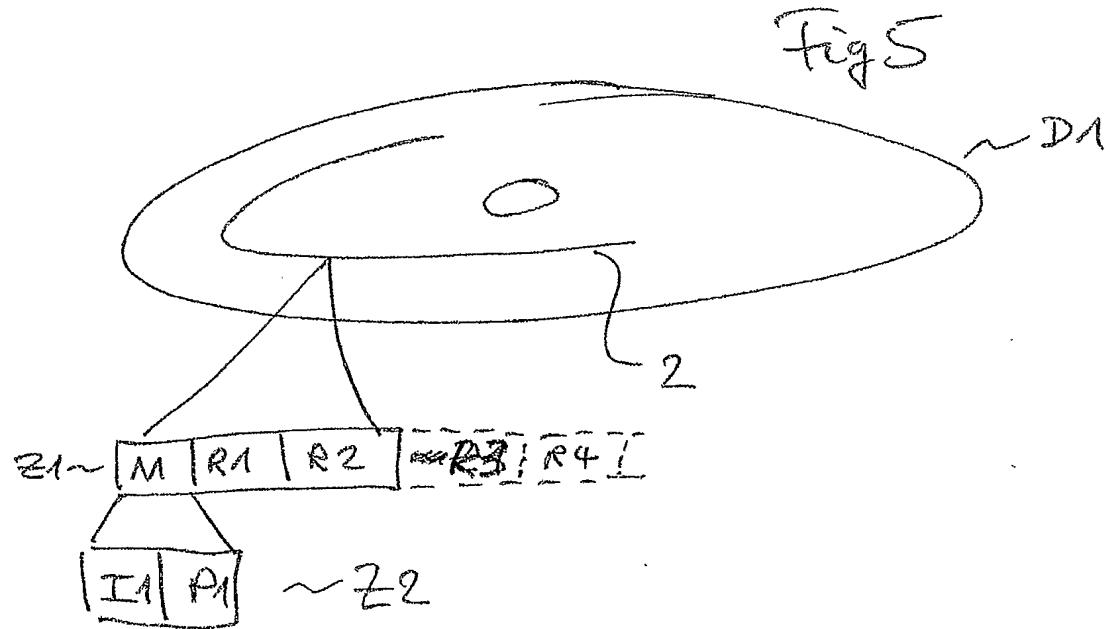


Fig 5